AYK REGION
YUKON ESC. REPORT # 4

ANVIK AND SALCHA RIVER ESCAPEMENT STUDIES

1970-1972

(From Yukon River Anadromous Fish Investigations)
Completion Report for July 1, 1970 to June 30, 1972

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ESCAPEMENT ENUMERATION

The Yukon River salmon fishery in recent years has been regulated largely the basis of obtaining and analyzing comparative commercial and test fishing h information which indicates the relative sizes of runs as they enter the river and move through the major fishing areas. Monitoring of spawning escapements has not played an important role in formulating in-season management decisions since the data available comes from tributaries too far from the fishery and too late in the season. Obtaining total annual escapement information is not possible under present funding or technology due to the vast size of the drainage and turbid water conditions that prevail along approximately 1,500 miles of the main river and in many tributaries.

Regardless of these limitations, obtaining improved escapement information in several key tributary streams throughout the drainage appears feasible and is essential in evaluating escapement trends in order to formulate long-range management procedures. Several projects were designed and implemented during the study period in order to upgrade this kind of escapement information. These include studies in the Anvik River, Salcha River and in the upper Yukon

River at Whitehorse.

Anvik River: In 1971 a preliminary survey was made of the Anvik River, which is one of the most important king and summer chum salmon spawning streams in the Yukon drainage, to determine the feasibility of establishing a salmon counting tower site. After initially encountering problems with high water, a suitable site was located and a preliminary count was made.

Based on experience gained in 1971, a second tower was constructed on the east bank of the river across from the original tower in 1972 (Figure 7). A 1250 watt generator and a light string were used to illuminate the river bottom during the few hours of darkness each night. A 20-foot weir was erected across from the tower to lead fish closer to the tower.

Counting operations began on July 5 and terminated activities on July 31. Sixteen-hour counts were made from 1000 until 0200 hours the following day. Counts were recorded for both hourly totals and the first 10 minutes of each hour.

Lack of adequate personnel prevented complete 16-hour counts from being conducted. Occasional unfavorable weather and water conditions plus faulty generators further reduced daily enumeration periods. Missing counts were estimated by averaging the last complete hourly count with the next complete hourly count.

Over a period of 290 hours during the 27-day counting period a total of 65,202 summer chum salmon and 527 king salmon was enumerated past the tower. Based on this data the expanded total escapements above the tower were calculated to be 108,342 chums and 1,104 kings (Table 5). Estimates made from 10-minute counts for the same hours were within 0.9 percent of the expanded counts for chum salmon and 5.9 percent for king salmon. A summary of hourly counts and estimates are presented for summer chum and king salmon in Appendix Tables 4 and 5 respectively.

The main summer chum salmon migration peak past the tower occurred on July 12, while the king salmon migration peaked on July 16 and 26 (Figure 8). The daily chum run was heaviest from 2100 to 0100 hours with the majority of fish migrating upstream from 2100 to 2300 hours. The king migration was greatest from 1300 to 1800 hours with the peak occurring between 1600 to 1800 hours with the peak occurring between 1600 to 1700 hours (Figure 9).

A proposed tower and weir site was selected for future use a mile downstream from the present site (Figure 7). The river is shallower and narrower at this point and water conditions are better for enumerating salmon.

re 7. Anvik River map, Swift River to Yellow River.

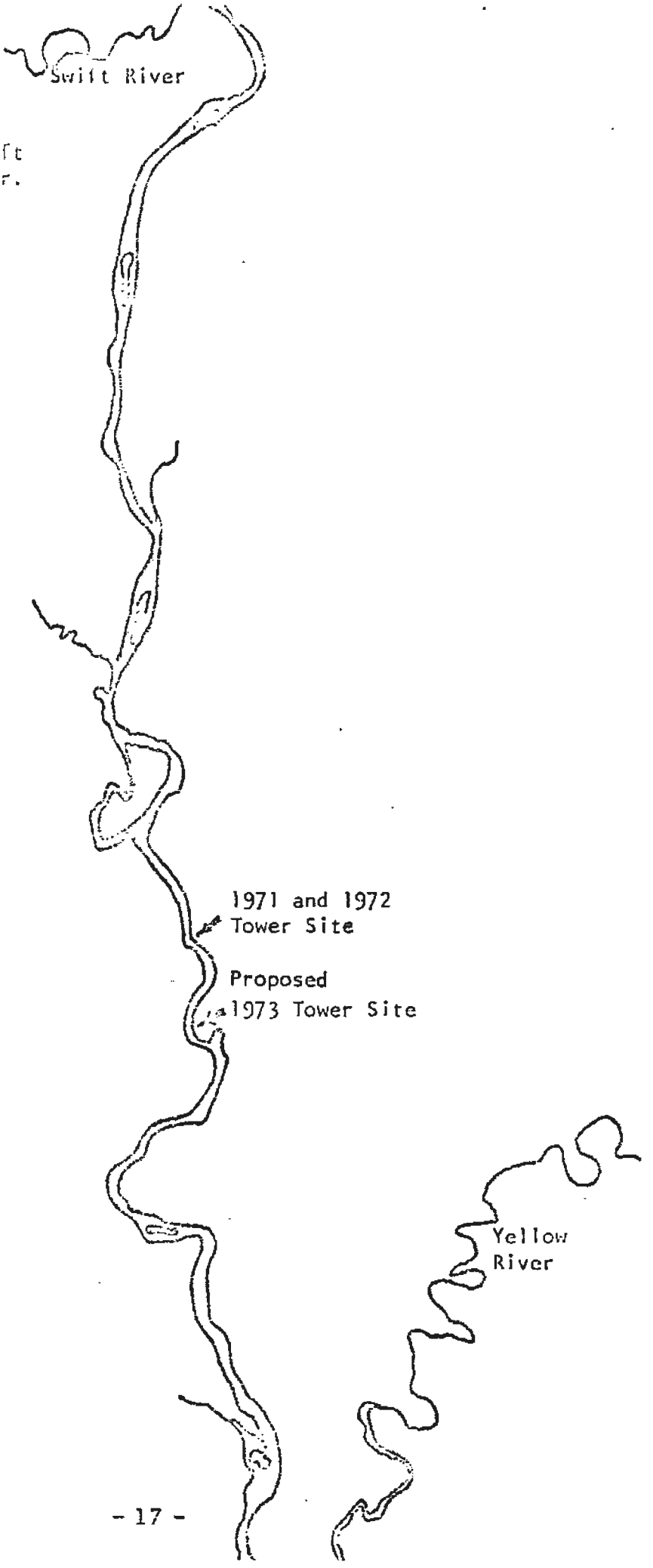

Table 5. mmer chum and king salmon enumeration summary /ik River tower, 1972

Date	Summer Chums					Kings			
	Hours counted	Actual Counts		Expanded Counts		Actual Counts		Expanded Counts	
		10 minute	Hourly	Hourly	Cumulative	10 minute	Hourly	Hourly	Cumulative
7/ 5	2	-	310	3,104	3,104	-	-	-	-
6	16	264	1,559	2,351	5,455	1	9	9	9
7	17	761	4,861	6,070	11,525	1	1	1	10
8	15	893	5,036	6,938	18,463	0	2	2	12
9	15	474	2,655	4,335	22,798	1	3	3	15
10	8	733	3,777	7,145	29,943	3	7	15	30
11	16	1,943	11,685	15,893	45,836	1	29	45	75
12	15	1,769	11,036	16,899	62,735	10	46	55	130
13	16	1,109	7,355	10,875	73,610	8	53	69	199
14	16	978	5,933	9,119	82,729	11	71	75	274
15	15	580	3,468	5,199	87,928	12	52	67	341
16	6	163	1,110	4,274	92,202	4	24	97	438
17	16	402	2,163	3,273	95,475	1	21	35	423
18	9	197	1,237	3,348	98.823	1	11	40	513
19	4	40	252	1,725	100,548	0	5	32	545
20	6	90	467	1,659	102,207	3	14	42	587
21	12	150	1,009	2,002	104,209	13	36	54	641
22	9	64	335	1,245	105,454	6	14	24	665
23	6	28	173	725	106,179	4	20	70	735
24	8	50	260	778	106,957	4	19	73	808
25	7	24	124	404	107,361	1	7	59	867
26	2	7	29	249	107,610	0	8	94	961
27	5	7	69	278	107,888	0	11	49	1,010
28	16	28	96	170	108,058	3	22	34	1,044
29	15	4	64	102	108,160	3	17	18	1,062
30	13	6	38	104	108,264	1	15	25	1,087
31	5	6	31	31	~~108,342~~ 108,295	1	10	17	1,104
TOTAL	290	10,770	65,202	108,342	108,295	93	527	1,104	

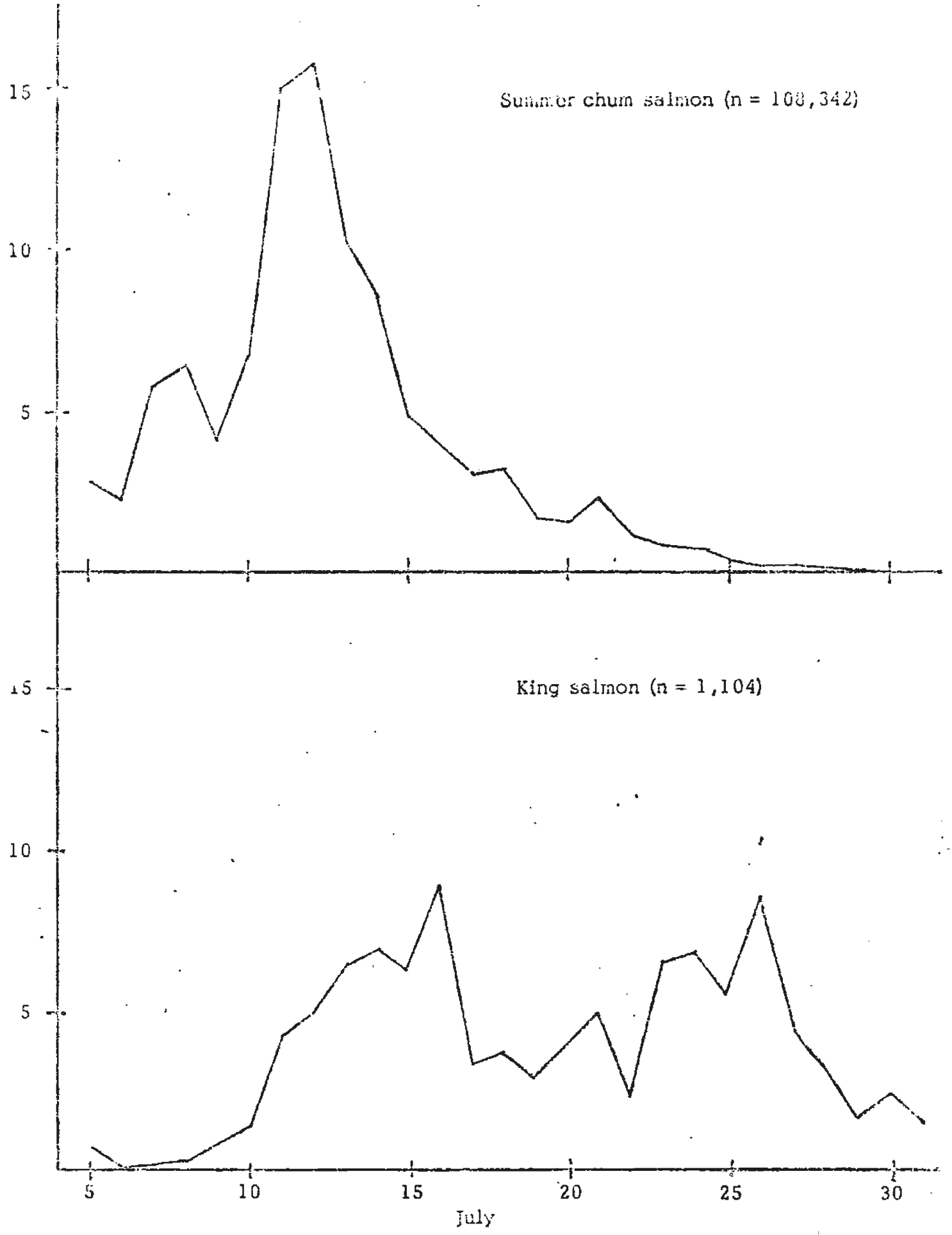

Figure 8. Daily summer chum and king salmon migration (expanded), Anvik River tower, 1972.

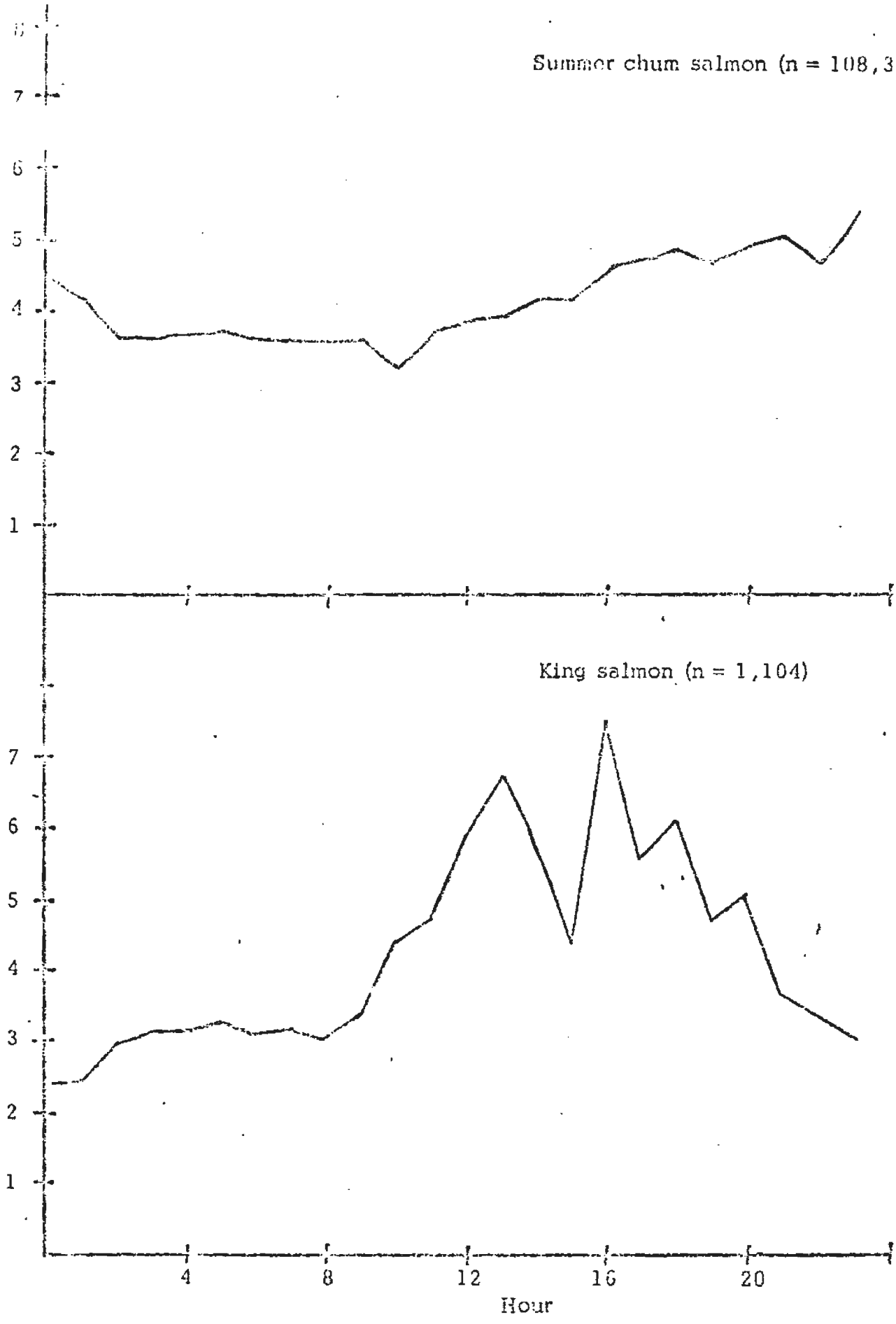

Figure 9. Hourly summer chum and king salmon migration (expanded), Anvik River tower, 1972.

Carcass sampling and enumeration surveys were conducted between July 20 and August 5 by boat and included the area from the mouth of Otter Creek to the river mouth. The objective was to obtain age and sex data of spawned out king and summer chum salmon plus obtain salmon species composition specifically to determine if a significant pink salmon population utilized the lower river for spawning. Age and sex data obtained from carcasses are discussed in a later section of this report.

During August 4-5, a carcass survey was conducted from the tower site to the river mouth. A total of 1 pink, 44,585 summer chum and 46 king carcasses was counted. Observations indicated that king salmon in the lower river were still actively spawning.

An aerial survey of the Anvik River was conducted on July 22 utilizing a float equipped Cessna 180 aircraft. A count of 211,633 summer chum and 418 king salmon was obtained from the headwaters to the river mouth which included 74,118 chums and 346 kings in that portion of the river above the counting tower. The cumulative expanded tower count through that date was 105,454 summer chums and 665 kings with the aerial survey accounting for approximately 70 percent of the chum and 52 percent of the king salmon escapement past the tower.

Based on the aerial survey data obtained below the tower and tower count data, the minimum total estimated escapement into the Anvik River was 245,857 chum and 1,176 king salmon. It was determined that few pink salmon spawned in the Anvik River during 1972.

Salcha River: In 1972 an extensive exploratory survey was conducted on the Salcha River (Figure 3) by a two-man crew in a riverboat. This survey was made from July 12 to August 18 to determine the abundance and distribution of king and summer chum salmon plus select and identify potential counting tower/weir sites. The proposed Prudhoe Bay to Valdez hot oil pipeline is scheduled to cross the lower Salcha River which gives these studies an even higher priority.

The area surveyed extended from the river mouth to the South Fork, a distance of 68 river miles. The shallow nature of the river necessitated the use of a flat bottom 24-foot riverboat powered by two 40-horsepower outboard motors equipped with jet units. All observations of salmon were recorded with spawning areas located and marked on maps. A number of king salmon redds were identified to specific locations by landmarks for possible future incubation studies. A six-foot wooden step ladder was fastened inside the boat and used as a tower to aid in observing salmon.

Throughout the study period all available salmon carcasses were sampled for age and sex data. All sampled carcasses were immediately disposed of into the brush on either side of the river to eliminate data duplication on subsequent sampling surveys.

A suitable tower site and the major king salmon spawning areas were identified (Figure 10). Three king salmon redds were marked and their position accurately mapped for possible future egg and larval development and survival studies. As a rule kings were observed spawning at the heads of riffles in 2-4 feet of water.

Numerous king salmon fry were located throughout the length of the main river upstream to No Grub Creek. Fry were concentrated along the shore, especially in cutback areas, near feeder streams and in slack water eddies.

An aerial survey made on August 3 accounted for 1,193 king salmon, the majority of which were spawning, in the main river from the mouth to the North Fork. A total of 143 or 12 percent of the count was obtained downstream from the proposed pipeline crossing. The greatest numbers of spawners were observed between Redmond and Butte creeks.

A total of 293 king salmon carcasses was enumerated during the boat surveys. Table 6 compares the distribution of live fish, carcasses and redds observed during the study. As expected, carcasses exhibited a downstream shift in abundance compared to live fish and redd distribution.

Carcass survey information also indicated that post spawning mortality is greater for females at an earlier period of time compared to males (Table 7). This differential post spawning mortality is significant when attempting to accurately assess the age, sex and size composition of the escapement through carcass sampling. Carcass age and sex data is presented in a later section of this report.

Whitehorse Dam Fishery: Each year since 1970 the Department of Fish and Game has supplied a fishery technician to sample king salmon at this fishery for age and sex and obtain daily escapement information. This information has been of considerable value in providing an escapement index for the upper Yukon basin (Figure 4). Comparative escapements are shown in Appendix Table 6. Age and sex data is summarized in a later section of this report.

Aerial Surveys: Because of the vast distances involved and the large number of salmon spawning streams present in the Yukon River system, the aerial survey method is used to enumerate escapement in certain key streams which are felt to be indicative of overall escapement in that area of the Yukon basin. During the peak of spawning, when water and light conditions are

Figure 10. King salmon redd locations, Salcha Riv 1972.

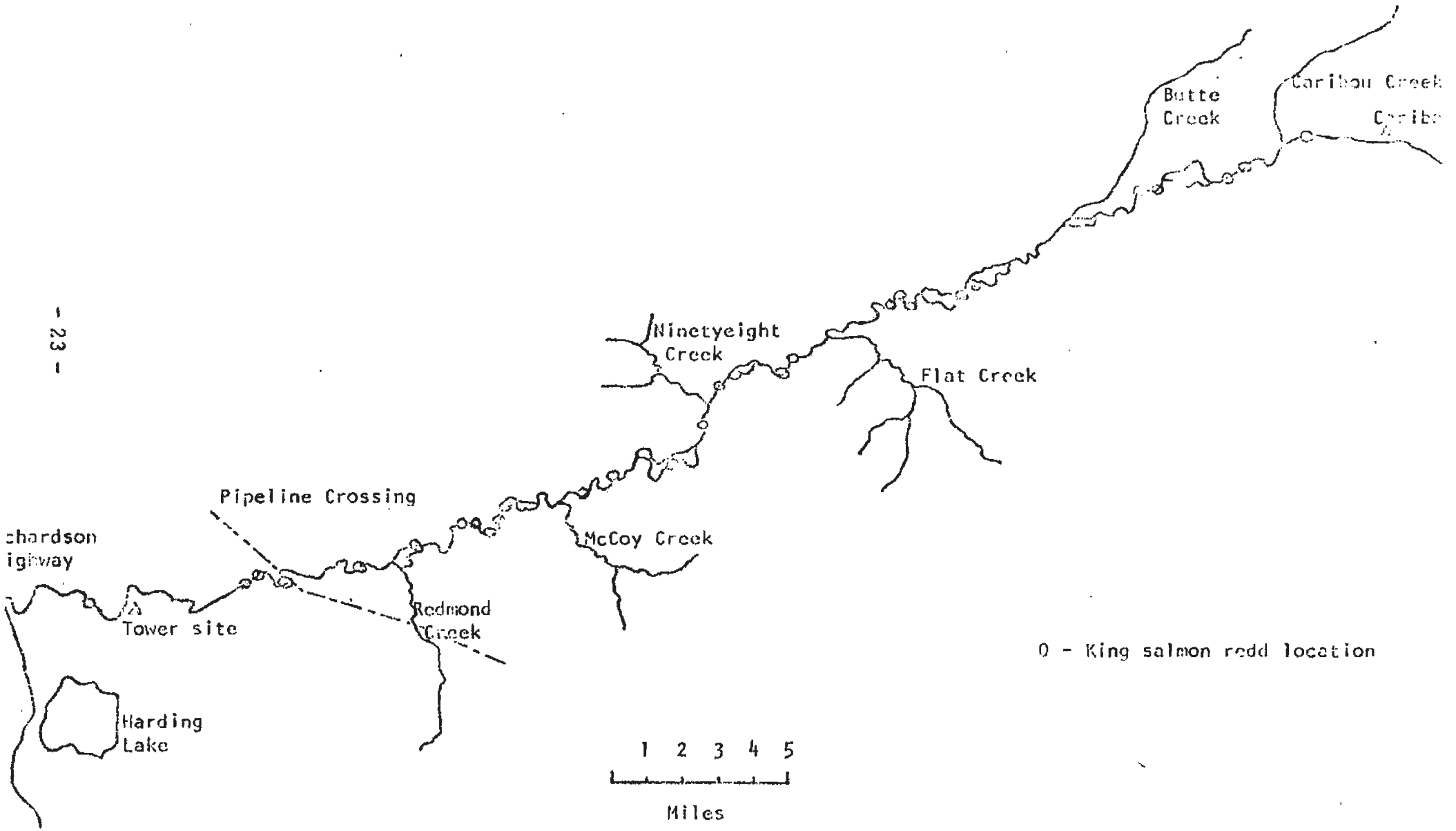

Table 6. King salmon abundance and distribution, Salcha River, 1972.

Area 1/	Aerial survey (8/3)		Carcass Survey (8/4-18)						Boat Survey (8/4-18)	
			Males		Females		Combined		Redds	
	Number	%	Number	%	Number	%	Number	%	Number	%
100	241	20.2	49	48.5	52	51.5	101	34.5	7	16.3
200	333	27.9	72	47.7	79	52.3	151	51.5	12	27.9
300	60	5.0	5	19.2	21	80.8	26	8.9	7	16.3
400	485	40.7	5	35.7	9	64.3	14	4.8	11	25.6
500	74	6.2	-	-	1	100.0	1	0.3	6	13.9
TOTAL	1,193	100.0	131	44.7	162	55.3	293	100.0	43	100.0

1/ 100 - River mouth to mouth of Redmond Creek
200 - Mouth of Redmond Creek to mouth of Ninety-eight Creek.
300 - Mouth of Ninety-eight Creek to mouth of Flat Creek.
400 - Mouth of Flat Creek to mouth of Butte Creek.
500 - Mouth of Butte Creek to mouth of North Fork.

Table 7. Daily king salmon mortality based on carcass observations, Salcha River, 1972.

Date	Males		Females		Combined	
	Number	%	Number	%	Number	%
8/ 4	4	1.4	7	2.4	11	3.8
5	2	0.7	15	5.1	17	5.8
6	7	2.4	15	5.1	22	7.5
7	6	2.0	10	3.4	16	5.4
9	4	1.4	8	2.7	12	4.1
10	8	2.7	16	5.5	24	8.2
11	19	6.5	25	8.5	44	15.0
12	21	7.1	9	3.1	30	10.2
13	12	4.1	21	7.2	33	11.3
14	16	5.5	15	5.1	31	10.6
16	21	7.2	14	4.8	35	12.0
17	5	1.7	2	0.7	7	2.4
18	6	2.0	5	1.7	11	3.7
TOTAL	131	44.7	162	55.3	293	100.0

timum for viewing, these streams are surveyed by Department biologists in single engine aircraft. While not precise, aerial surveys are an important management tool when no other means of assessing escapements are available. Comparative annual aerial survey escapement counts made in index streams for king and summer chum salmon are presented in Appendix Table 7 and 8 respectively.